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Z(m)	d/D(Zf=0.3m)	d/D(Zf=1m)	d/D(Zf=10m)
0.1	0.4	0.47	0.49
0.2	0.1	0.21	0.24
0.4	0	0.078	0.12
0.6		0.035	0.078
1m			0.045
1.2m			0.037
1.5m			0.028
2m			0.022

FIG. 3A

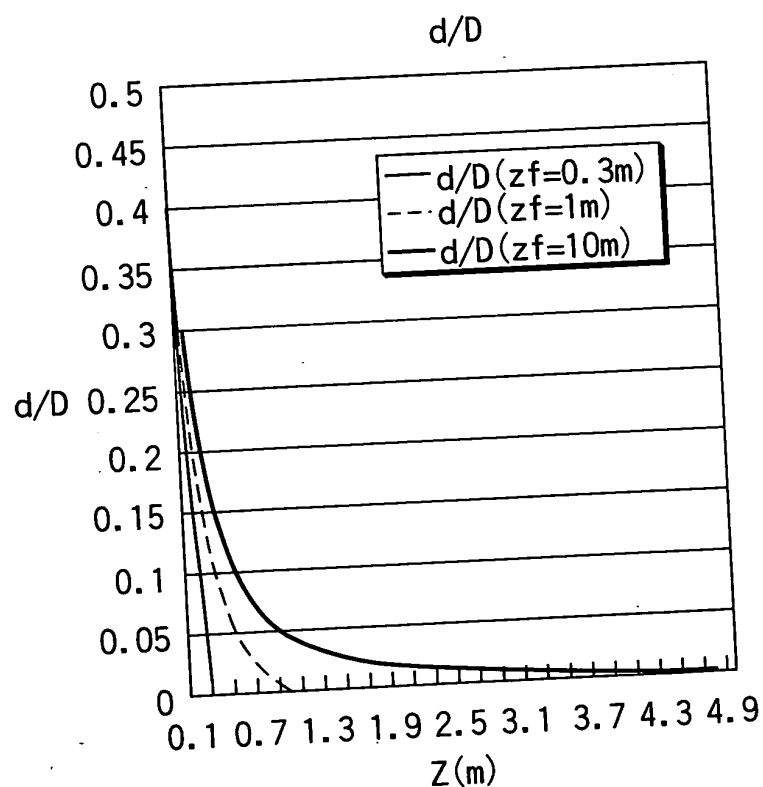


FIG. 3B

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Z(m)	d/D(Zf=0.3m)	d/D(Zf=0.6m)	d/D(Zf=2m)
0.2			
0.4	0.05		
0.6	0.10		
0.8	0.125	0.022	
1	0.140	0.363	
1.3	0.153	0.0489	
1.6	0.163	0.0570	
2.0	0.170	0.0630	
2.5	0.176	0.0690	0.0051
3	0.180	0.0727	0.0085

FIG. 4A

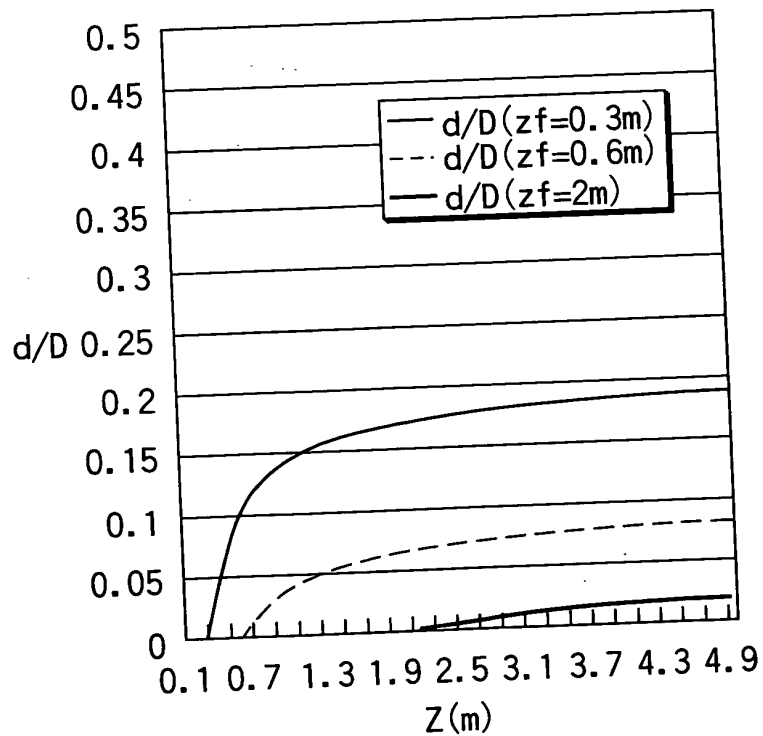


FIG. 4B

09476910.010300

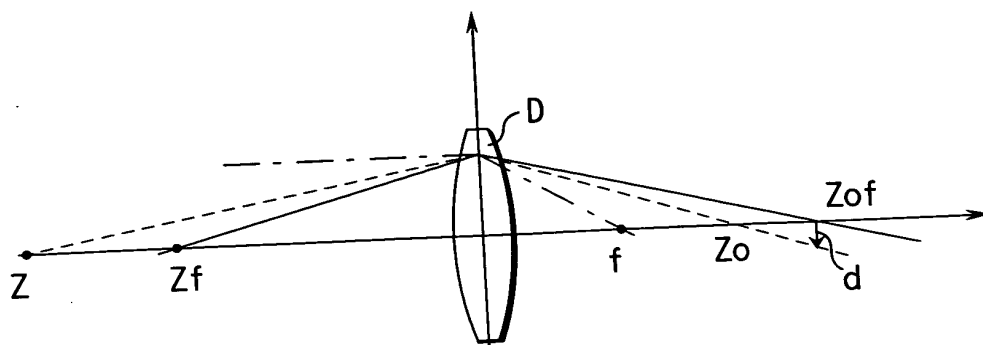


FIG.5

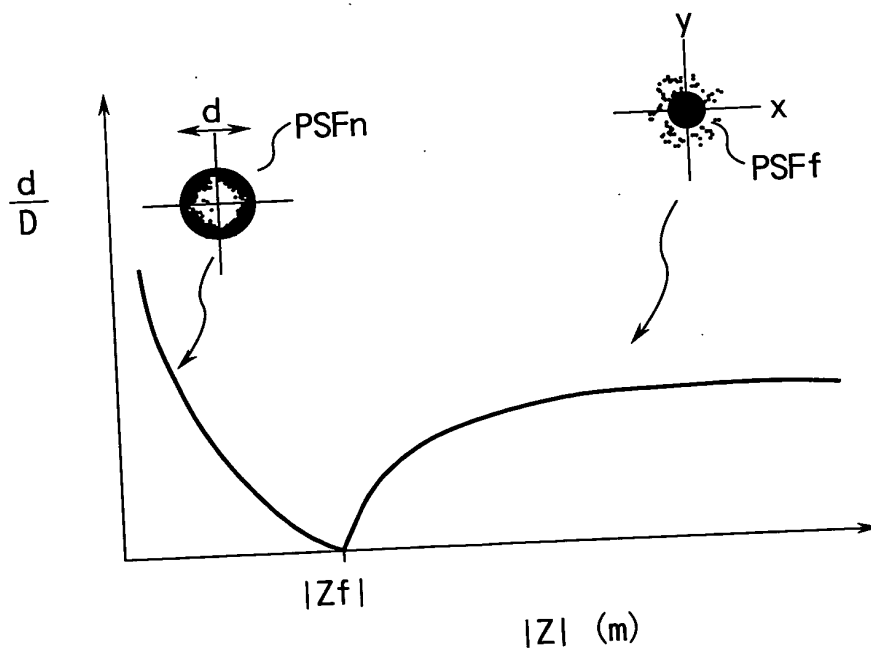


FIG.6

The diagram illustrates a lens system with a lens centered at the origin of a coordinate system. The horizontal axis is labeled with Zf , Z , f , Zfo , and Zo . A vertical axis is labeled r and 0 . A ray path is shown as a solid line starting from Zf , passing through the lens, and ending at Zfo . A dashed line represents another ray path starting from Z and ending at Zo . A coordinate system (g, r) is shown with g as the horizontal axis and r as the vertical axis. A circular cross-section of the lens is shown to the right of the coordinate system.

The figure consists of two parts. The top part is a schematic diagram of an optical system. It shows a lens with focal length f . The object plane is at distance Z from the lens, and the image plane is at distance Z_{fo} from the lens. The focal point is at distance f from the lens. The bottom part shows a coordinate system with x , y , and r axes. A central spot represents the beam profile, and the origin is labeled 0 .

FIG. 7B

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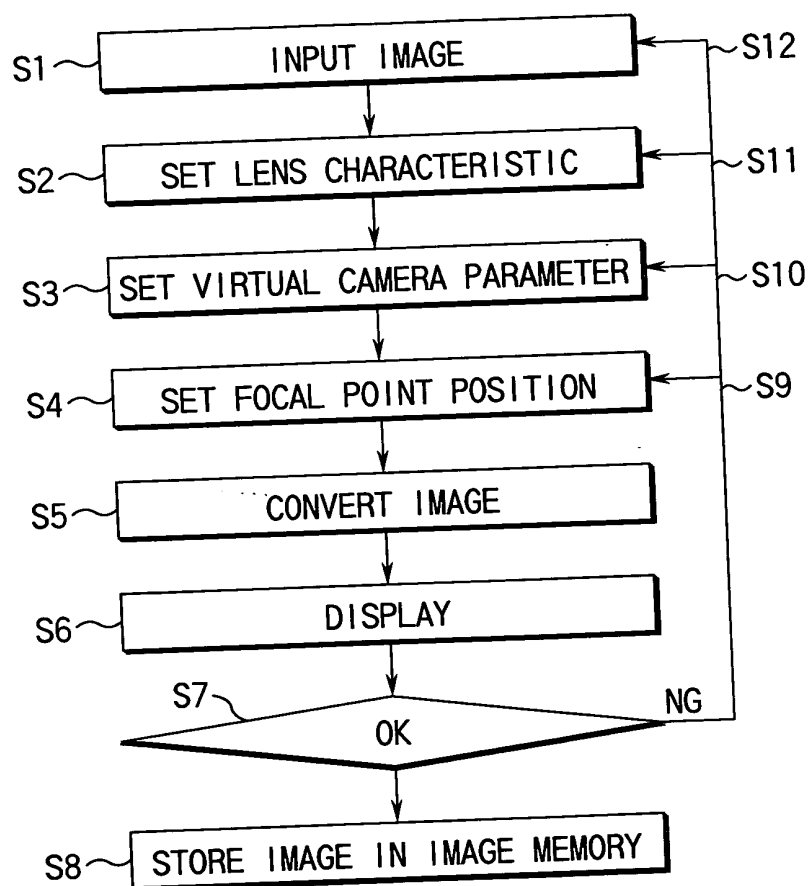


FIG. 8

```
graph TD
    S11["R(x,y,z)  
G(x,y,z)  
B(x,y,z)"] --> S12["Ri(xi,yi,z)  
Gi(xi,yi,z)  
Bi(xi,yi,z)"]
    S12 --> S15["START CALCULATION  
FOR EACH CELL"]
    S15 --> S13["CALCULATE d  
d1=D * (1/|Z| - 1/|Zf|) * |Z| < |Zf|  
d2=D * (1/|Zf| - 1/|Z|) * |Z| > |Zf|"]
    S13 --> S14["INPUT SET PARAMETER  
D, Zf, f"]
    S14 --> S13
    S13 --> S17["BLUR STATE AT POINT j BY Ri  
Rji(xj,yj) = Ri(xi,yi) * g(xi-xj, yi-yj)"]
    S17 --> S18["BLUR STATE AT POINT j BY ALL POINTS  
Rj(xj,yj) = Σ Ri(xi,yi) * g(xi-xj, yi-yj)"]
    S18 --> S19["END"]
```

The flowchart illustrates the following steps:

- S11**: Input color components $R(x,y,z)$, $G(x,y,z)$, and $B(x,y,z)$.
- S12**: Convert the input into discrete data $R_i(x_i,y_i,z)$, $G_i(x_i,y_i,z)$, and $B_i(x_i,y_i,z)$.
- S15**: Start calculation for each cell.
- S13**: Calculate the distance d based on the focal distance $|Z_f|$ and the current distance $|Z|$.
$$\begin{cases} d1 = D \frac{1}{\frac{1}{|Z|} - \frac{1}{|Z_f|}} & |Z| < |Z_f| \\ d2 = D \frac{1}{\frac{1}{|Z_f|} - \frac{1}{|Z|}} & |Z| > |Z_f| \end{cases}$$
- S14**: Input set parameter D, Z_f, f . This step is linked to S13.
- S17**: Blur state at point j by R_i . The calculation is $R_{ji}(x_j, y_j) = R_i(x_i, y_i) g(x_i - x_j, y_i - y_j)$. This step is linked to S13.
- S16**: Determine g . The calculations are $g_a(r) \leftarrow a_1, a_2, a_3 \dots$ and $g_b(r) \leftarrow b_1, b_2, b_3 \dots$. This step is linked to S17.
- S18**: Blur state at point j by all points. The calculation is $R_j(x_j, y_j) = \sum_i R_i(x_i, y_i) g(x_i - x_j, y_i - y_j)$.
- S19**: END.

FIG. 9

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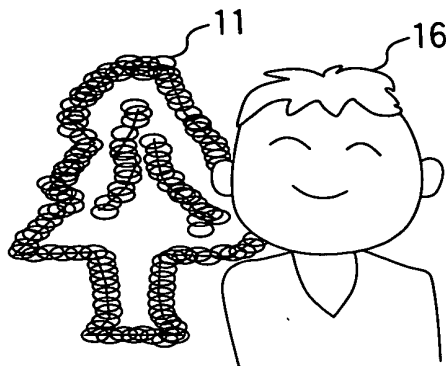
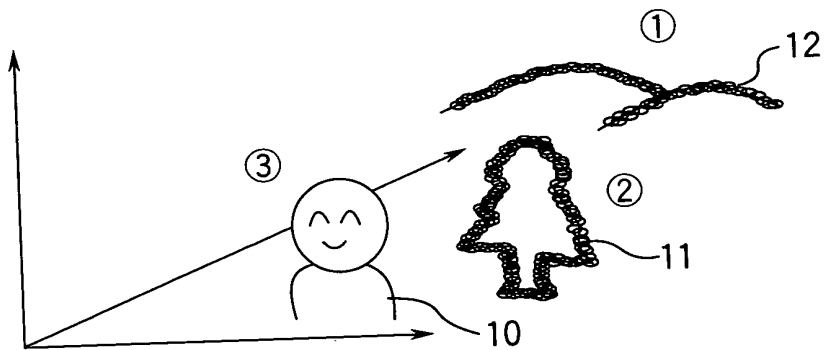


FIG. 10A



PROCESSING FROM OBJECT HAVING
LARGE $|Z|$ IN UNITS OF OBJECTS

FIG. 10B

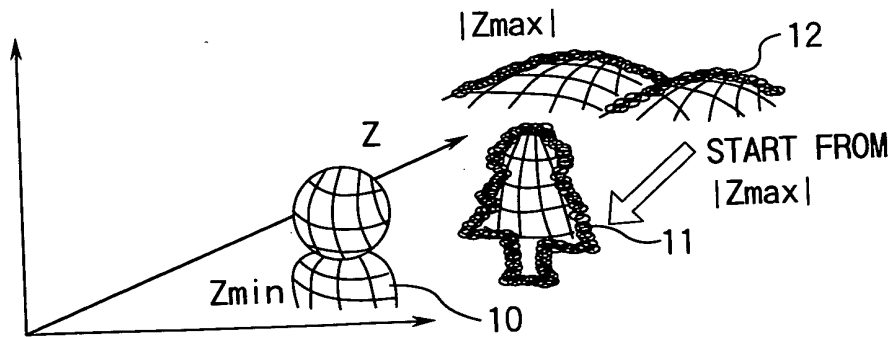


FIG. 10C

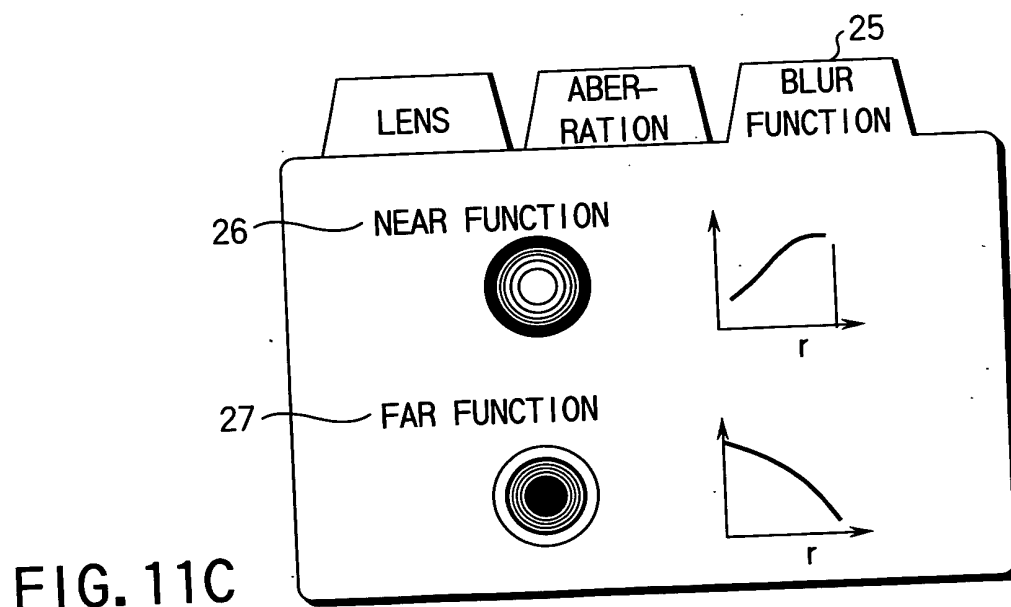
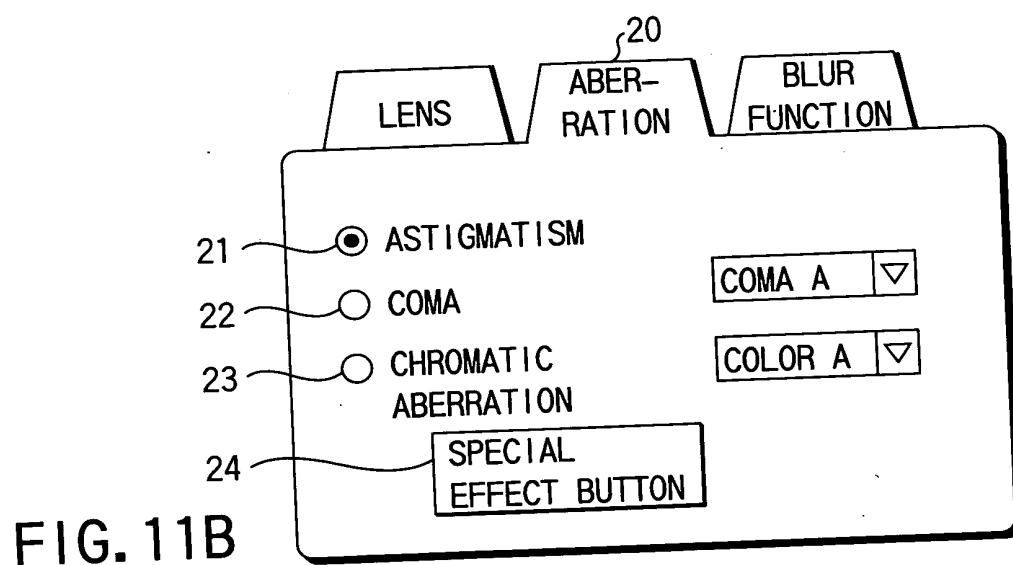
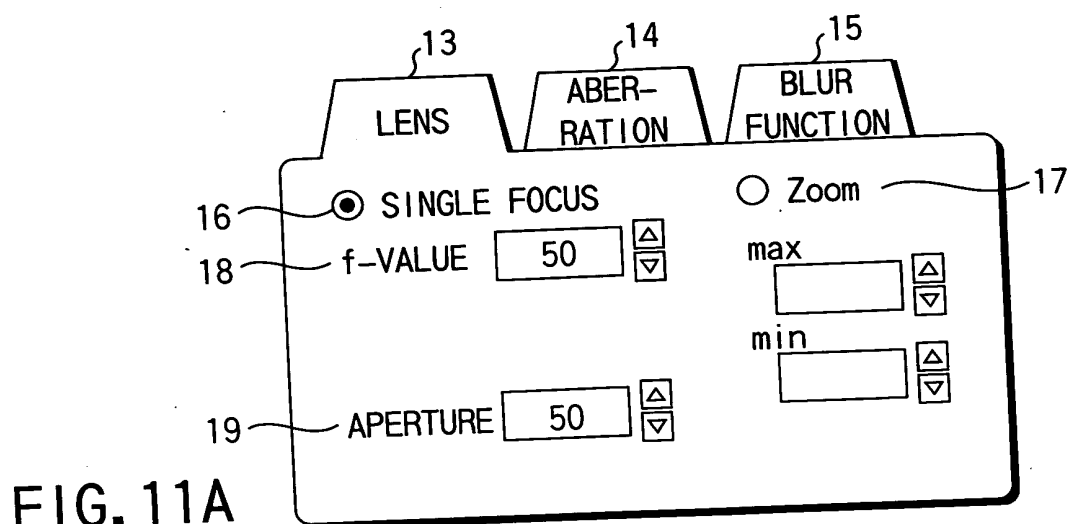


FIG. 12

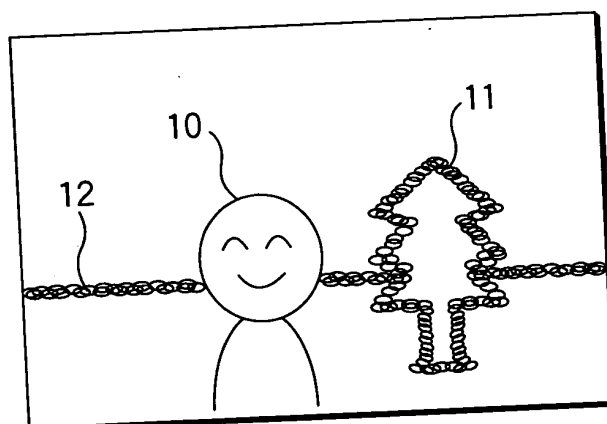


FIG. 14

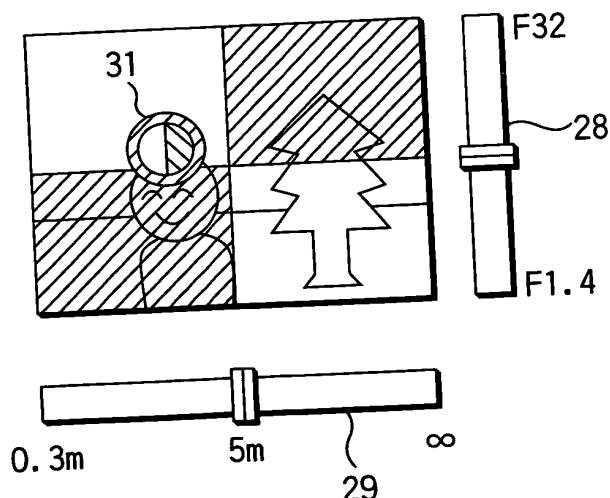


FIG. 15

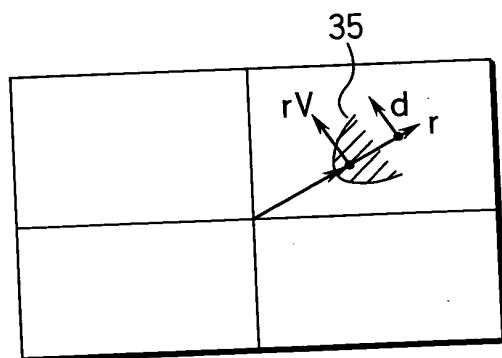
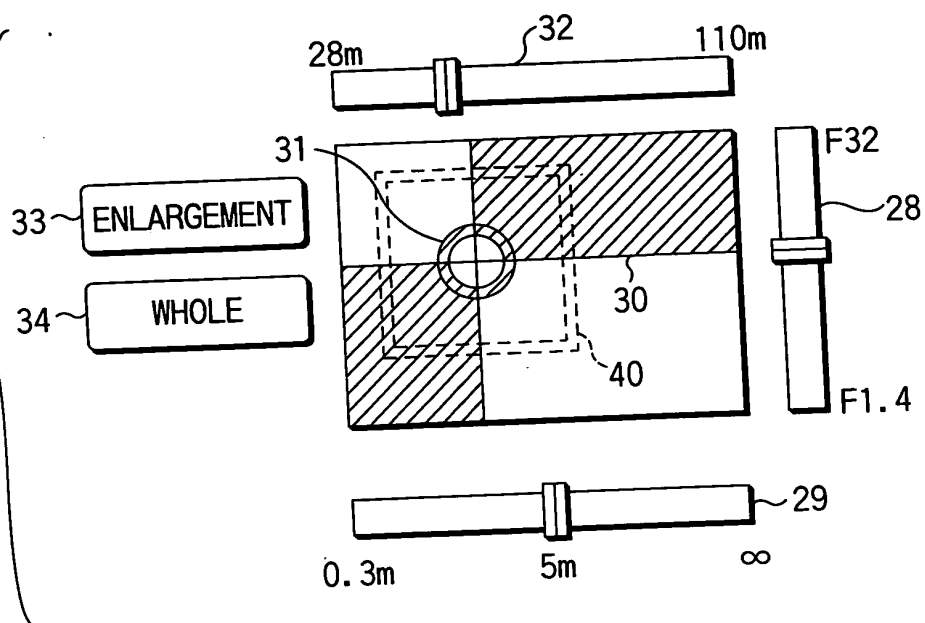


FIG. 16A

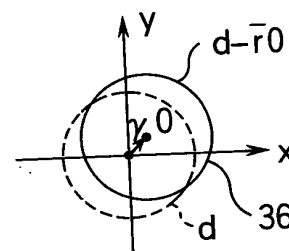


FIG. 16B

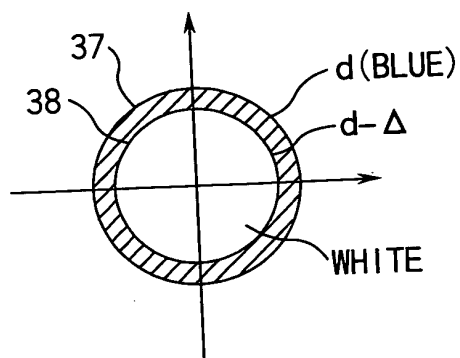


FIG. 17A

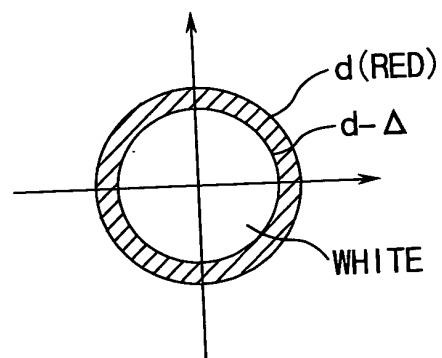


FIG. 17B

FIG. 18A

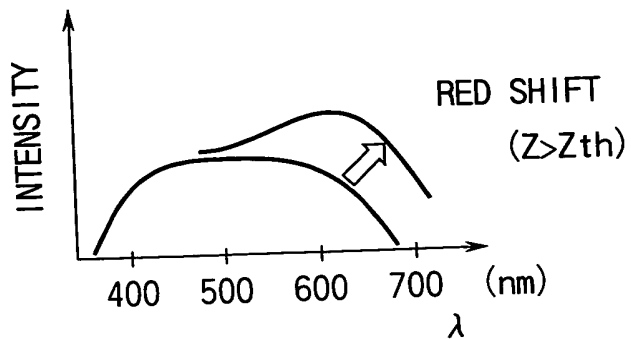


FIG. 18B

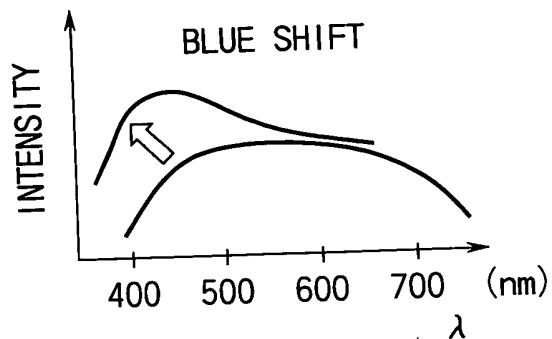


FIG. 19A

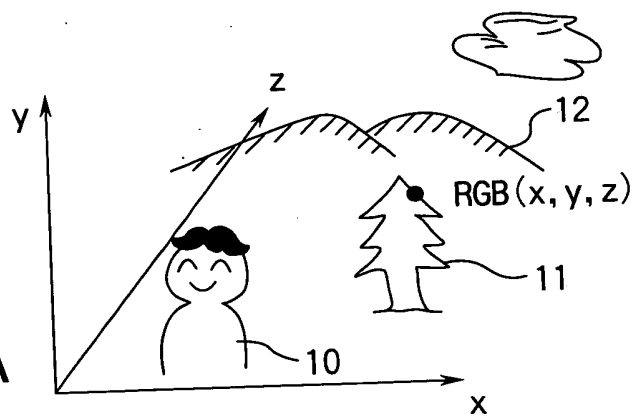


FIG. 19B

